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ODP 1391-77
15 July 1977

MEMORANDUM FOR: EAG Members

FROM : Clifford D. May, Jr.
Director of Data Processing

SUBJECT : Response to Key ADP Issue #3

1. In the DDCI memorandum of 16 December 1976 on the ADP Issues, he identified Issue #3 pertaining to the balance that should be achieved between centralized and decentralized ADP facilities in the Agency. ODP was charged with studying this issue working with NPIC, ORD, OCR, ISS and possibly other components.

2. Attached is the ODP report on this study. The material which formed the basis of the report was gathered by an inter-office task force consisting of [REDACTED]

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The task force members have been provided copies of the report but it has not been discussed with them and they have not been asked to formally concur in the report in its present form.

3. The report on Issue #3 is currently scheduled to be discussed by the EAG on 26 July 1977.

[REDACTED]
Clifford D. May, Jr.

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Att: a/s

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RESPONSE TO KEY ADP

ISSUE #3

15 July 1977

Prepared by the Office of Data Processing

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

TABLE OF CONTENTS

Executive Summary

1.0.0. Introduction

2.0.0. Current Situation

2.1.0. Computers in the Agency

2.2.0. Decentralization of Central Services

2.3.0. ADP People

2.4.0. ADP Management

3.0.0. Discussion

3.1.0. ADP Facilities

3.1.1. Standalone Minicomputers

3.1.2. Minicomputers in the Central System

3.1.3. Summary

3.2.0. ADP Professionalism

3.2.1. Decentralization of ADP Groups

3.2.2. Community Implications

3.2.3. People Costs (Software Development)

3.2.4. An ADP Professional Career Service?

3.3.0. Management of ADP

3.3.1. Planning

3.3.2. Design and Acquisition of Decentralized
Facilities

3.3.3. Resource Requirements

4.0.0. Conclusions

5.0.0. Recommendations

Attachments

Appendix A Terms and Definitions

Appendix B How We Got Here

Table 1 Chronology

Appendix C Where We Are

Table 2 Resource Allocation

Table 3 Agency Computers

Table 4 ADP Budgets

Table 5 Terminals

Appendix D Pros and Cons of Centralization/
Decentralization

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EXECUTIVE SUMMARY

(U) This paper is the third in a series of responses to four ADP issues identified by the DDCI in his memorandum to EAG members dated 16 December 1976 that should be addressed by the EAG. The DDCI's goal in identifying the issues was to "take positive steps during the coming year to improve central management of our total ADP program." The first two issues were discussed by the EAG on 31 March and 5 April 1977. Agreement was reached on actions to improve senior management control of the month-to-month use of central services and to improve top management's ability to plan future ADP resource requirements. This paper discusses Issue 3 - that relating to the issue of centralization vs. decentralization of ADP in the Agency. The Issue is stated as follows in the DDCI memo:

"What balance should we be striving to achieve between centralized and decentralized computer facilities? I understand that there are many complex balances involved, including dedicated vs. massive machines, distributed vs. central processing, and decentralized vs. centralized systems development."

(U) This paper approaches this issue by studying three aspects of the centralization/decentralization issue: facilities, professional personnel, and management. It takes stock of the current situation and how we got here, examines the factors bearing on the issue, then reaches some conclusions and provides recommendations for the EAG. The conclusions and recommendations of this paper are summarized in the following paragraphs.

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(U) The Agency currently has a mix of centralized/decentralized ADP facilities which has evolved with little central direction or overall plan. Technology has made the minicomputer an increasingly attractive alternative to the central system and there are pressures to employ more minicomputers in the Agency. Many applications can be better satisfied on a minicomputer system, but case-by-case studies are needed to make this determination. It is likely that decentralized minicomputers will grow in the Agency at a much faster rate than in the past. Large central general purpose computer facilities will continue to be required for the foreseeable future. No specific mix of centralized/decentralized ADP facilities can or should be established by the Agency, but better central planning is needed. Agency policies should not inhibit the growth of minicomputers when they offer a better alternative to the central system.

(U) As more computer facilities are decentralized in the Agency, it is important that more attention be given to maintaining professional standards for ADP personnel who will design and implement both the centralized and decentralized facilities and applications. This is essential if we are to maintain high quality ADP service in the Agency. A study should be conducted on the desirability of an Agency-wide ADP professional career service. Also, a central source of professional ADP advice and assistance should be available to user components that are considering acquiring ADP systems, especially

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minicomputers. User components should also be able to establish their own ADP support groups, if they prefer.

(U) Currently, the Agency does not have any central policy, planning, or management relating to the acquisition of dedicated minicomputer facilities. At the same time, the Agency is under increasing external pressure to speak with one voice on ADP matters to external organizations who are dealing with ADP policy, resource, and management issues. It is essential that the Agency provide a high level central mechanism for policy formulation, planning, and resource control of ADP, and for representing the Agency's interests to these external organizations. This is particularly important if we move toward an increasingly decentralized environment.

(U) In summary, the recommendations are that:

- a. Minicomputers should continue to be employed by the Agency where they offer a cost/effective alternative to the central system.
- b. Responsibility should be assigned for providing Agency-wide technical support to offices considering ADP systems, especially minicomputers.
- c. Responsibility should be assigned for providing Agency-wide long and short term ADP planning.
- d. Responsibility should be assigned for formulating ADP policy for the Agency and for representing the Agency's ADP interests to external organizations.
- e. Responsibility should be assigned for conducting a feasibility study of an Agency-wide ADP professional career service.
- f. Resources should be provided to fulfill the above responsibilities as assigned.

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1.0.0. (AIUO) Introduction: In his memorandum to the EAG members dated 16 December 1976, the DDCI identified four ADP issues that should be addressed by the EAG. His goal in identifying the issues was to "take positive steps during the coming year to improve central management of our total ADP program." Two of these issues were discussed by the EAG on 31 March and 5 April 1977. Agreement was reached on actions to improve senior management control of the month-to-month use of central services and to improve top management's ability to plan future ADP resource requirements (Issues 1 and 2). The purpose of this paper is to discuss Issue 3 - that relating to the issue of centralization of ADP vs. decentralization of ADP in the Agency. The Issue is stated as follows in the DDCI memo:

"What balance should we be striving to achieve between centralized and decentralized computer facilities? I understand that there are many complex balances involved, including dedicated vs. general-purpose computer systems, minicomputers vs. massive machines, distributed vs. central processing, and decentralized vs. centralized systems development."

(AIUO) The issue, as stated by the DDCI, appears to focus on the question of centralization/decentralization of the ADP hardware facilities themselves. Hardware is an important issue at the present time because pressures are increasing to make greater use of minicomputer and the Agency does not have a plan or an effective management mechanism to cope with this problem. We believe that the hardware question cannot be properly addressed in isolation

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from other related issues of centralization. Of equal im-

portance are the questions of how we ensure high professional standards for ADP personnel in an increasingly decentralized environment, and how we improve central management of decentralized facilities. For example, as facilities are decentralized along with their support personnel, must greater attention be given to centralized career management of ADP professionals? How else are we to achieve high and consistent professional standards in our system designs and equalize the opportunity for career advancement for our ADP professionals? Similarly, as technology drives us toward greater decentralization of facilities, what kind of management arrangements will be needed to ensure that the goal of "improved central management of our total ADP program" is realized?

(AIUO) This paper, therefore, will attempt to answer these questions by looking at three aspects of the centralization/decentralization issue: facilities, professional personnel, and management.

2.0.0. (AIUO) Current Situation: The current mix of centralized and decentralized computer facilities has been the product of a gradual evolution since ADP technology was first introduced to the Agency. A detailed description of the current mix and the evolutionary process is provided in Appendices. Appendix A contains the terms and definitions used; Appendix B contains background information and a chronology of key events which have affected this evolution; Appendix C contains an overview of where the Agency finds itself at the present time in the mix between centralized and decentralized facilities.

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(AIUO) The first significant step toward providing a centralized Agency-wide general purpose service occurred in 1963 when the Office of Computer Services (OCS) was established in the DDS&T. However, since that date, the growth of decentralized facilities outside of the general purpose computer services has continued at about the same rate as the centralized facilities. There has been no sustained attempt to either encourage or discourage this growth or to establish Agency-wide policy or guidelines affecting the growth of decentralized facilities. Today, we have a diversity of computers throughout the Agency with roughly half of our ADP resources invested in ODP's general purpose computer facilities. The centralized/decentralized choice has been mainly influenced by users needs and their perceptions of the pros and cons of centralization/decentralization. Appendix D, taken from the soon to be published book "The Waves of Change" by Charles P. Lecht, lists some of these. Also, the level of ADP professional competence in the user organizations often played an important part in the user-office decision to acquire and exploit decentralized facilities. In this regard, there is a growing level of ADP expertise in the user organizations. Most college graduates who now enter the Agency have some degree of ADP training. They are quick to explore the use of ADP as a tool in performing their Agency duties, and some become highly proficient ADP professionals.

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2.1.0. (C) Computers in the Agency: Today we can identify over a hundred computers in the Agency with a total value of about \$70 million. Table 2 of Appendix B lists these computers and identifies the principal purposes for which they are used. Some 93 of these, supplied by 27 different manufacturers, would fall in the category of minicomputers and represent an investment in hardware of \$3.5 million. Seventy-two of these minicomputers are operated in a standalone decentralized environment. We are unable to precisely determine the investment in software that is run on these 93 machines, but as a general rule, ADP software costs exceed the hardware costs over time. Nor are we able to determine the number of people that are required to support these minicomputers.

(C) Fourteen Agency computers can be classified as large machines, costing over \$2 million each. They are all installed in the central facilities of NPIC and ODP. The NPIC computers serve not only NPIC but also the entire Intelligence Community for certain data processing associated with imagery exploitation. Most computers in the ODP central facility are used to provide general ADP services to the Agency and the Intelligence Community Staff. However, several ODP computers are standalone dedicated systems specifically tailored by ODP to support a single customer (e.g. COMIREX Automated Management System [CAMS] and Telemetry Analysis Display System [TADS]).

(C) There is a significant amount of work being done on the central computers that is best handled centrally.

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These applications require the large computing capacity, speed, and multi-services offered by the central facilities, and are characterized by large-scale scientific computing, large integrated data bases, extensive use of batch facilities, or the need for specialized services. Both NPIC and ODP centralized facilities for the past few years have emphasized design which decentralized both the access to and use of their facilities. The intent has been to bring the computing power to the user, instead of the reverse.

2.2.0. (C) Decentralization of Central Services: The emphasis on bringing computer power to the user has resulted in an explosive growth in facilities which provide decentralized access to the central facilities. Remote ODP-operated facilities have been established at 21 locations to provide convenient access to the central facilities from these outlying locations. Terminal facilities have been established in 289 locations providing direct access to the central services from the user offices. These remote terminals are operated by the users. Remote ODP data entry facilities have been established in 3 locations to enable data entry and editing at the remote site and direct entry of the prepared data to the central system via telecommunications facilities.

(AIUO) Customer needs and available technology are moving us toward decentralizing the availability of what are normally called "central services" and toward greater user involvement from the user locations. The availability of these

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decentralized services in the user offices has sparked the growth of a large group of professional applications systems development personnel outside of the framework of the central facilities. In fact, a large number of computer programs run in the central facilities are written and used by personnel from decentralized locations. While these services basically amount to a do-it-yourself capability for the user, the consumption of these services is monitored in ODP and reported to the user office senior management.

25X9 2.3.0. (C) ADP People: In a recent survey, we were able
25X9 to identify over [REDACTED] positions in the Agency which were occupied by ADP personnel. ODP has [REDACTED] are in NPIC. In addition, about 150 man years of ADP work is done by contractor personnel for the Agency. Personnel in the central facilities (ODP and NPIC) provide system programming, computer operations, applications development and maintenance, production control, data entry, consulting, and management for a wide range of uses. And people from the central services are assigned on a rotational basis to positions in user components to perform primarily systems development functions. Some components (OCR and ISSG) have a system development function completely staffed by their own personnel using ODP's central facilities. Components that have decentralized equipment normally do not have full time operators, i.e., operating a computer is incidental to other duties.

(AIUO) Agency ADP personnel are trained in the special technical courses run by ODP and NPIC, in selected

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courses given by vendors, the government, or universities, and on-the-job. Professional standards for systems development, systems programming, and operations, are locally developed and vary with the organizations.

(AIUO) The Office of Data Processing manages the only ADP professional career service in the Agency (MZ Career Sub Group). This career service includes all ODP professional and technical personnel, whether assigned to an ODP position or on a rotational assignment to another component. It is responsible for maintaining high professional standards for ODP personnel and for looking after their professional development, assignment, promotion, and career counseling. Other recognized ADP organizations also attempt to build and maintain a strong, competent, and competitive corps of ADP professionals.

2.4.0. (AIUO) ADP Management: Planning and management of ADP in the Agency are largely carried out at the Office level. Since the dissolution of the Agency's Information Processing Board in 1974, there has been no continuing Agency management mechanism to set forth objectives, review plans, and provide guidance regarding such activities. Headquarters Regulation [REDACTED] ADP Management and Administration, appeared to draw ODP into a central Agency planning role by stating that all requirements for ADP services, equipment, or software, should be coordinated with ODP as soon as practicable. However, this is seldom accomplished. Instead,

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coordination with ODP is usually during the final step in the procurement process after plans and budgets have been finalized. This fact, coupled with the limited resources ODP has been able to devote to such review, has made the Regulation ineffective, both as a planning mechanism and as a control mechanism.

(AIUO) The EAG recently approved the procedures which provide for EAG review of ADP planning and tighter control of ADP resource requirements and investments. These procedures will be exercised this year for the first time during the FY-79 budget review and are expected to improve senior Agency management control over use of ADP facilities and resources spent on ADP.

(AIUO) In support of overall Agency ADP management, ODP is required to maintain an Agency-wide ADP Management Information System (MIS) containing an ADP system and equipment inventory and ADP resource requirements (people and dollars) for all Agency components. This requirement was originally established in response to reporting requirements imposed by GSA regulations. However, we have been given an exception from reporting to GSA and the information in the ADP MIS is presently maintained only for occasional internal Agency use.

(AIUO) Use of the central facilities by Agency components is monitored and documented in the Project Activity Report (PAR) produced by ODP. This is an accounting of ODP manpower and hardware facilities used by Agency components and is the sole report of its type that we are aware of.

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It monitors only ODP activity and is not representative of total Agency activity. ODP uses this report to identify and review unusual levels of activity and sends it to user component managers for their review. The component manager is expected to assure himself that the level of ODP services used by his component is justified in support of his mission.

3.0.0. (AIUO) Discussion: The main focus of this report is on the question of ADP centralization or decentralization in the Agency. The arguments for decentralization are generally concerned with improving effectiveness, while argument for centralization deal with efficiency. The Agency has already decentralized ADP activities in several ways. First, we provide centralized facilities which function in a decentralized mode via the time sharing/batch services; second, we use small computers for standalone applications; third, we use small computers for certain functions in the large system, e.g., data entry via mini's. We have arrived at this mix in an evolutionary way without any overall Agency plan to guide us.

(AIUO) We believe there is no effective or practical way for the Agency to adopt a pure strategy of either centralization or decentralization, but that good planning is necessary to ensure that the mix at any point in time represents the most cost/effective Agency solution. Continuation of a mix of centralized and decentralized facilities is likely to be required for the foreseeable future.

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The basic choices for management involve future direction and emphasis. The decisions as to which facilities and functions will be decentralized need to be made on a case-by-case basis. The policies regarding professional ADP people and ADP management must be consistent with this flexible strategy on hardware facilities.

3.1.0. (C) ADP Facilities: We are heavily committed to the large central systems. The value of installed ADP equipment in ODP and NPIC is approximately \$66 million, with at least a like amount spent on the development of application programs to date. Furthermore, both ODP and NPIC are in the final phases of major upgrade programs to bring their centers up to the level where they can adequately support the demand for new applications. But, each day seems to bring additional improvements in the minicomputer hardware and software which greatly expand the options of ADP system designers for both new applications and redirection of the existing workload on the central systems. Many of these applications are of moderate size and can function effectively in a standalone mode on a minicomputer. Some vendors offer turn-key minicomputer systems which include hardware/software design, implementation, and support as a package. The system used in the Agency's Northwest Federal Credit Union is an example of such a turn-key application system. There are, most likely, many other Agency activities which could effectively use such a facility.

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3.1.1. (U) Standalone Minicomputers: The requirements for each proposed new minicomputer application must be judged on a case-by-case basis. User requirements that include data privacy, high reliability (95-99%) and availability, fast response time, and an independent data base of reasonable size should be regarded as minicomputer application candidates. In some cases, requirements meeting these criteria for minicomputer applications may still be better placed on centralized equipment because the total cost (tailored software, hardware, installation and maintenance) for a minicomputer could be greater than the centralized system cost. Laboratory and monitoring applications, process control applications, and some data communications applications are normally considered as standalone applications. The ready availability of software to process the application on a minicomputer may be the compelling reason for selecting this alternative as opposed to centralization because software development costs are expected to exceed hardware costs during the next five years.

(U) Comparison of cost/benefit over system life should always be a major factor in deciding when to place an application on a standalone minicomputer system. While the minicomputer represents an attractive alternative, it is not a panacea. Limited memories, only moderately fast processors, relatively high cost peripheral devices, and primitive capability for file back-up, report generation,

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error recovery, multi-level security, and data management pose severe constraints on the general applicability of mini-computers.

(U) There is often a tendency to underestimate the size and scope of a computer application. In addition, most users, after they get their hands on a new ADP system, begin to discover many other features they would like to have. The result is that small computers tend to grow into larger computers. If left alone, they grow into general purpose centers - computer utilities - becoming bigger and more complex.

(U) Certainly, a general purpose computer service will continue to be needed in the Agency to serve a variety of needs. Such a utility is as important an Agency asset as its library and printing plant. But, proliferation of facilities for general use should be avoided, including the expansion of minicomputer facilities, to provide general services. The temptation to do this will be strong because of the power at the upper end of the line of several vendors' minicomputers and the seductive paths to get there. Total independence from the central computer utility is an expensive and questionable goal for the large user of ADP services.

3.1.2. (U) Minicomputers in the Central System: While the minicomputer has offered an attractive alternative to enable users to get away from large central systems, it also has provided opportunities for functional partitioning of the central computer processing tasks into minicomputer sub-systems. This is important because computer system complexity

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in the central systems has developed as an undesirable side effect of our efforts to get the most out of our computing machines. The technical people in our central shops have done a superb job in adding new applications into their systems at a low marginal cost. But, the savings realized by sharing the power of a large system among several users may be offset to an increasing degree by the overhead costs. These costs include: maintaining large hardware systems; adding reliability features to avoid catastrophic effects of failure, and, creating the organizational structure required to manage the central system.

3.1.3. (U) Summary: It is apparent that minicomputer systems, especially those designed and marketed for particular applications have, or soon will have, sufficient power to handle a significant portion of Agency computer jobs. Agency policies and ADP management should be geared to support and encourage the use of minicomputers as a viable alternative to large central systems. This is not meant to imply that there will be a diminishing need for large central systems. Rather, we can expect increased opportunities for use of minicomputer systems, both in standalone applications in user offices and as components of central systems.

3.2.0. (U) ADP Professionalism: A serious misconception has plagued the ADP business from the beginning, namely that anybody can do it. As the Agency moves in the direction of systems that can be used directly by non-ADP professionals,

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there must still be professionals behind such systems. The Agency needs professionals to evaluate what their peers in industry provide us. A professional programmer or system designer is expected to know a great deal about the machine with which he is working. He can and does consider several factors that may not be apparent to the more casual user but have a long-range impact on the effectiveness of an operational ADP system. These include backing up files, error recovery procedures, reducing program execution time, writing programs maintainable by others, etc., - in short, what is evolving as "acceptable ADP practice."

(U) The Agency needs to cultivate this professionalism and have it be a part of all of its ADP efforts, wherever they are planned and operated. As we move toward greater decentralization of our ADP people, this becomes more difficult.

3.2.1. (C) Decentralization of ADP Groups: Already, a trend towards decentralization of ADP people in the Agency is evident. But this has occurred without overall direction and somewhat haphazardly. In some cases, user offices have recruited their own ADP experts and established integral ADP groups. In other cases, user office personnel have become semi-professional ADP people. In still other cases, ODP has assigned ADP professionals from the MZ Career Sub Group to the user offices on rotational tours. Generally, these user-office ADP groups are made up of personnel devoted

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mainly to developing applications systems and their professional skills are limited to this area. OWI and OER are examples of using components that have such application groups. However, OC and OD&E have managed much broader computer systems activity using contractors. OCR and ISS/DDO nearly qualify as centralized groups because they serve people (albeit those with common problems) outside their own organizations.

(AIUO) There are increasing pressures to create more ADP application design and development groups in major user offices. This is readily understandable because of the many advantages that the user-office management will realize. They will have direct control over: use of resources; priority setting; response to current problems; requirements to be satisfied; flexibility; and, perception of their own problems. On the other hand, both they and the Agency have to pay a price for these advantages. They will have to worry about: the continuity of their professional ADP work force; the annual budget exercise; how to maintain quality control and standards; how to limit growth; program documentation; and others. From an Agency point of view, this further decentralization can result in multiple solutions to the same problem; failure to apply ADP resources to the most critical Agency problems, and further fragmentation of our ability to effectively respond to Agency-wide and Community-wide considerations.

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3.2.2. (AIUO) Community Implications: We believe it is particularly important in the current environment to comment further on the last point above - "Community-wide considerations." The Intelligence Community Staff has a number of important Community issues under study, including Community-wide data standards, Community data bases, standard retrieval languages, computer security, hardware/software commonality, and others. As we decentralize the personnel performing ADP system development, it will be increasingly difficult for the Agency to play an influential role in development of Community-wide guidelines in these areas and to abide by any Community standards that emerge.

3.2.3. (U) People Costs (Software Development): The development of computer applications, whether done centrally or decentrally, represents a major ADP cost to the Agency. Every recent industry study of the future of ADP predicts that software costs will exceed hardware costs during the next five to ten years. A major factor contributing to the cost of applications development is the quality of technical talent available for such development. In addition, our project management skills - producing a system on time, within costs, meeting the requirements - contributes in a major way to the cost of applications development. Unfortunately, our performance in these development efforts is mixed. Some existing systems have been managed and developed by personnel lacking skills in either applications development or project management. As we continue to decentralize without

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any guiding Agency-wide professional and programming standards, the risks of building costly, inefficient ADP systems increases.

3.2.4. (AIUO) An ADP Professional Career Service? We therefore believe that it is extremely important that Agency-wide ADP professional standards be established and maintained. We also believe that in order to attract and retain good ADP people we need to offer professional challenges and career opportunities to them. One method of achieving both of these goals would be to establish an Agency-wide career service for ADP professionals. An ADP career service along the lines of other career services in the DDA has been proposed and debated informally in the past. We believe that a formal study of the issue is appropriate now. One starting point for such a study could be a proposal for expansion of the MZ Career Service to include positions and incumbents with titles classified in the ADP category by the Civil Service Commission. Elaboration of this strawman proposal and others could be discussed further here, but our main concern is that the problem of maintaining ADP professionalism be faced squarely.

3.3.0. (AIUO) Management of ADP: The Agency has survived, and in some ways thrived, in the absence of a central manager for ADP. The absence of such an umbrella has encouraged diversity and has avoided the imposition of an additional layer of management in conducting the near-term ADP activities of the Agency. The cost to the Agency has been at best an untidy organizational appearance to the outside world, and

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at worst, the lack of sound management control over a major Agency resource. Headquarters Regulations on ADP management have had only limited success in achieving the desired results.

(AIUO) However, it is clear that the Agency can no longer afford a hands-off management policy on decentralization. If increasing decentralization is an objective, it must be carefully planned. It is particularly important to have central control for the selection, procurement and system development of general purpose minicomputers. And ADP professional employees must be responsible for these configurations. Turn-key, laboratory/monitoring, process control and data communications minicomputers do not require as much central control, but equipment and software selection might be reviewed centrally.

(AIUO) Planning, control and review of decentralized ADP activities will be very difficult without strong central management. If the objective is to strengthen central ADP management and control, then increased planning, control and review over present decentralized ADP activities are necessary, and mandatory for increased decentralization.

3.3.1. (AIUO) Planning: We believe that our most serious management problem is the lack of overall Agency planning. This has hurt us in a number of ways. Long-term needs are rarely addressed. Rarely are plans reviewed in an Agency-wide context. A well thought out plan by one component too often comes as a surprise to another component affected by the plan.

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

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(AIUO) Budgeting is the closest thing we have now to an Agency-wide policy and planning mechanism for ADP. But this has limited value in the planning function because budgeting is more of a competitive than a cooperative process among Agency components. And cooperation is imperative in Agency ADP matters because so many groups are often affected by the ADP decisions of any one organization. As the use of ADP tools in the Agency becomes more pervasive and put more directly into the hands of the manager who needs them, coordinated planning and central guidance from the top could become a more serious concern.

(AIUO) During the spring of this year, the EAG approved procedures intended to give them control of the month-to-month consumption of central ADP services and to improve their ability to plan future ADP resource requirements. While this is a much-needed step, it is dealing with finished plans prepared by separate components and is not intended to function as a focal point for Agency-wide management and planning.

(AIUO) It is particularly important that the Agency come to grips with this problem and establish a means of:

- a. Formulating ADP policy and planning guidance for the Agency.
- b. Coordinating Agency-wide ADP planning.
- c. Representing the Agency's ADP interests to external organizations such as: General Services Administration; National Bureau of Standards; Interagency Committee on ADP;

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Information Handling Committee; and, The President's Reorganization Task Force on ADP Management.

- d. Providing Staff support for EAG actions relative to ADP matters.

This, together with the new EAG procedures, will provide the positive steps to improve central management of our total ADP programs desired by the DDCI.

3.3.2. (U) Design and Acquisition of Decentralized Facilities: Aside from the problems of tighter central management of the total Agency ADP program is the problem of managing the design and acquisition of computer systems in an increasingly decentralized environment. Selection, procurement, installation, maintenance, and efficient use of ADP equipment and software involves many skills and considerable knowledge about Federal regulations and accepted practices. There are few people who have this knowledge and expertise. They must make it available or pass it to many others if orderly decentralization of ADP is to be accomplished. A partial list of considerations includes: GSA/ADP procurement regulations, site preparation for ADP equipment, ADP security, equipment maintenance requirements, acceptance testing, rental vs. purchase options, and how to specify software. In addition, the ADP market changes rapidly. New machines and new software packages need to be reviewed constantly for their relevance to the problem at hand. The Agency is barely able to cope with these complexities now; unmanaged decentralization will aggravate the situation.

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(U) ADP decentralization in the Agency probably should proceed along the lines already evident, but with more comprehensive Agency-wide planning and with tighter central management of acquisition decisions. The user-manager at the component level should be able to design, own, and operate his own minicomputer system. However, his plans should be consistent with Agency-wide guidelines on such matters as standards, maintenance, and procurement procedures. The user-manager must also reflect in his plans the justification that a standalone minicomputer system is the best solution to his problem. Agency expertise in the computer, communications, and procurement fields should assist in formulating his plans.

(U) On the other hand, the user-manager should be able to ask a central ADP organization to do most of the work for him. The central organization should help him determine whether to use a minicomputer or a central system. If a minicomputer would be more effective, then the central organization should provide expert assistance in bringing the minicomputer on-line. We believe that specific Agency components should be given the responsibility and resources necessary to provide Agency-wide advice and assistance to components considering a minicomputer system.

3.3.3. (U) Resource Requirements: Decentralization of facilities is not likely to decrease ADP costs in the near future unless several large computers are eliminated. This probably is not possible in the foreseeable future

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

CONFIDENTIAL

~~CONFIDENTIAL~~

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

because minicomputers still are of limited power (many applications will still need large capacity, fast processing), requirements for new large systems continue, and the economy of scale is still operable in many cases. The trade off is frequently user effectiveness vs. Agency efficiency, and effectiveness costs more. Also, the ADP personnel requirements associated with decentralization are not likely to either level off or decrease, but may be less visible.

4.0.0. Conclusions: In view of the above it is concluded that:

a. (AIUO) Minicomputer systems, especially those designed and marketed for specific applications, have or soon will have the capability to handle many Agency computer jobs. It is clear that decentralized ADP facilities are feasible in the Agency to a far greater extent than in the past and that Agency policy should not arbitrarily inhibit the move toward greater decentralization.

b. (AIUO) The Agency must have central computer facilities. Many major computer application systems require the capacity, power, speed, and production services provided by the large-scale machines in central facilities. Other applications, while lesser in either scope, priority, or complexity, should make use of the available capacity of the central facilities to achieve overall operating economies. However, many of these minor applications are good candidates for conversion to mini's as the reserve capacity of the central facility nears depletion.

c. (AIUO) There is no mix of centralized-decentralized ADP facilities in the Agency that could be set and remain constant. A flexible policy, good planning, and good management will be continually required to keep an effective centralization-decentralization balance. The general good health of Agency ADP activities should permit management to adopt any new policies or direction in an evolutionary way, rather than by radical change.

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and indeed reinforced. The development and maintenance of systems to be used by many customers, i.e., generalized systems, must be done by ADP professionals. Development in this case means selection, procurement, and installation and maintenance of hardware, in addition to software development and maintenance. Professional assistance must be available to assist in the system design and acquisition of standalone minicomputers. The Agency needs to adopt professional standards for ADP personnel and to treat its ADP professionals in a uniform way. There should be equity across the Agency in promotion procedures, rotational assignments, standards for professional performance and performance evaluation, and career progression.

e. (AIUO) The increased use of both minicomputers and networked computers of various sizes is inevitable. New requirements and uses will be found for both central facilities and separate standalone computing elements. The lack of central, comprehensive Agency planning for ADP activities will delay or defer progress and possibly be more expensive than necessary. The central services do both long- and short-range planning, but there is no equivalent planning for decentralized activities. There should be.

5.0. Recommendations:

a. (AIUO) The Agency should continue the case-by-case examination of computer applications for the possible use of minicomputers as an alternative to the large central system and prepare for an increase in the growth of minicomputers.

b. (AIUO) Responsibility for providing Agency-wide technical support of design, acquisition, and maintenance of ADP systems should be assigned. This would include advice and assistance to any component considering a mini-computer system and the testing and selection of a standard family of supportable minicomputers for Agency-wide use. ODP would be a logical candidate for this assignment.

c. (AIUO) Responsibility for comprehensive Agency-wide ADP planning, both short term and long term, should be assigned. The plan should include those decentralized components not now included, and should identify clearly what has been excluded, and why. The review and monitoring functions should also be assigned, and performed jointly with the EAG. A new component, probably at the DDCI level, should be assigned these responsibilities.

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

a. (AIUO) responsibility should be assigned for formulating ADP policy for the Agency and monitoring its execution, and for representing the Agency's interests to outside organizations. This would cover ADP standards for Agency-wide use and Agency participation in Community or interagency ADP activities. The new component in para. c. above would be the logical place for these jobs.

e. (AIUO) The responsibility to conduct a feasibility study of an Agency Career Service for professional ADP employees should be assigned. The objective would be to allow greater decentralization of ADP professionals while maintaining and reinforcing professional standards. Such a study would include the identification of ADP professionals Agency-wide, means to structure the career service Agency-wide with minimum disruption, and recommendations for career management, performance standards, and performance evaluations. The Director of Personnel would be a logical choice for this assignment, possibly supported by an inter-office task force.

f. (AIUO) Sufficient resources to carry out the above responsibilities should be provided to the organizations selected.

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

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Terms and Definitions

1. ADP Equipment. Automatic data processing equipment (ADPE) means general purpose commercially available, and mass-produced automatic data processing components and the hardware systems created from them regardless of use, size, capacity, or price that are designed to be applied to the solution or processing of a variety of problems or applications. ADPE does not include specifically designed equipment intended for a specific application, or a component of a general purpose computer system which is imbedded in a larger equipment system intended to satisfy a specific application.
2. General-purpose computer system. A computer configuration which is used or is usable for multiple functions or purposes and usually meant to be shared among several users.
3. Dedicated computer system. A computer configuration which is limited by function or is dedicated to serving one application or customer grouping. May also be called a standalone system.
4. Minicomputer. A computer system with a basic price of less than \$150,000, a stored program processor, and a capability to connect external digital devices. Also called a small computer in this report.
5. Turn-key system. A computer system procured as a single software, hardware, and documentation package which can be directly applied to an end user application with little or no effort to adapt the system to his needs.
6. Centralized ADP facility. An organization whose primary mission is to provide a full range of ADP services to at least one other organization.
7. Decentralized ADP facility. An organization that performs limited ADP services only for itself in the performance of its mission.
8. ADP systems development. The selection, adaptation, and integration of hardware and software to meet a user need. The task involves computer programming (analysis, design, coding, and modification).
9. Distributed processing. The division or separation of processing functions, capabilities, and/or responsibilities into self-sufficient units using different pieces of hardware and united by a common control mechanism.

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

10. ADP Personnel. ADP Personnel are those individuals connected with ADP or ADP-related support functions (e.g., ADP policy and management officials, systems development, applications development, and operations personnel, etc.). Included are personnel from ADP user organizations principally assigned to ADP support functions in support of others in the user organization. However, personnel in user organizations who simply use ADP incidental to the performance of their primary function are not to be considered ADP personnel.

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

CONFIDENTIAL

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

~~APPENDIX B~~

How We Got Here

How we got here was influenced by what was happening in the computer industry; and by Agency decisions made to take advantage of new opportunities and to advance Agency capabilities. Major features identified in the explosive growth of ADP are listed below.

- Technology influences

Hardware and software capabilities, capacity, and speed of execution advanced at exponential rates. Integrated circuits and computer architecture, as represented by the IBM 360 series, began the "chip" revolution, which greatly decreased the size of components and increased the speed of execution and the numbers of other devices which could be attached to central processors.

- Economy of Scale

With the advent of large, general purpose machines, economy of scale (one large machine doing the work of four smaller machines at only twice the cost) became a very big factor in centralizing ADP facilities.

- Computer Utility

Simply put, the idea was that multiple users would share central services. The implication was that the central service had enough hardware capacity to handle peak loads and software capability to:

- 1) Translate requests to the required input format,
- 2) Process the request, using whatever file(s) necessary and using the correct software,
- 3) Route the response(s) to the appropriate location(s), and
- 4) Perform many such requests at the same time.

Implicit in the idea was that computer facilities are analogous to a telephone company or an electric company.

- Interactive Requirements

These requirements were: 1) The need for current information (query capability). 2) The need to transmit current data over some distance (teleprocessing). 3) The

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need for more people to have access to shared computing tools (time sharing). These requirements brought forth new operating systems with extensive facilities for communication handling and file access (or separate computers to accomplish these functions); file processing with extensive capability to control file integrity; and significant amounts of new applications software. The growth in data communications equipment and software, file management programming systems, teleprocessing systems, data entry hardware and software, cathode ray tube terminals and ultimately, valid uses for general purpose minicomputers all stemmed from this need for current information, right now, right here.

- Emergence of minicomputers

Recent development of greatly increased input/output capabilities, core storage, and language compilers/interpreters made minicomputers an increasingly versatile part of both centralized and decentralized computer installations. Within the Agency, 93 small computers from 27 manufacturers are now being utilized for a wide variety of uses. Seventy two are controlled outside the central facilities. These machines introduce a new dimension of opportunities for management control of computer capabilities and reducing overall complexity.

- Law of diminishing assets

Each new software system developed in the Agency required resources, both hardware and manpower, for initial system development and start-up, and continued to draw resources for enhancement, maintenance, and operation. As we implemented more systems, more resources had to be devoted to the maintenance of these systems and our ability to develop new systems diminished significantly. Thus, major new system development now requires either the authorization of new positions, or halt in maintenance or enhancements of selected ongoing systems. The failure to make adequate development resources available to the central facilities is one reason for the desire to develop major new systems outside the central facilities and to acquire separate component programming staffs. The fact that additional resources are required in order to start up these separate staffs is often overlooked.

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Agency decisions to exploit and control the changes in the ADP industry were reflected for the most part in hardware acquisition, and organizational changes. Table I summarizes a chronology of significant milestones in the evolution of ADP in the Agency.

• Management Concern

Mr. Schlesinger was a strong proponent of ADP centralization, and he set in motion the consolidation of hardware facilities. In March 1973, a recommendation to merge the OCR computer center with OJCS was approved. In June 1974, the merger of the DD/O computer center with OJCS was approved. Both of these mergers had been discussed by the Information Processing Staff for some time. In both cases, only the computer operations functions (including computer operators and operating systems programmers) were transferred; the applications systems analysis and programming functions (and personnel) remained in place.

One of the most important decisions which affects how we now manage ADP was taken in May, 1974, when the Information Processing Board was abolished, along with the Information Processing Staff. The Comptroller stated that, "The Director has approved the concept of abolishing the Information Processing Board and decentralizing the functions of the Information Processing Staff, O/Comptroller. The decision to effect these changes reflects a conclusion that such special management controls over ADP at the Agency echelon are no longer necessary in light of the recently approved consolidation of Headquarters computer centers." Apparently the fact that about 50% of the Agency's computer resources still existed outside of the framework of the consolidated computer centers was not considered sufficient reason to maintain a central Agency management organization. The functions of the Staff were distributed to various components, and as a direct outgrowth of this dissolution, Headquarters Regulation [REDACTED] was put into effect, governing the acquisition of ADP hardware and software, and delegating the responsibility for coordination and concurrence, but not approval, to the Director of Data Processing.

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In summary, the rapid growth of requirements for ADP over the last decade, coupled with the tremendous increases in the capabilities and capacities of ADP hardware and software caused management to centralize hardware for better management control and for cost effectiveness. However, little was done to provide effective management control over the ADP resources that were not centralized. Systems development personnel were not completely centralized; indeed there has been an increase in the number of ADP personnel outside the central facilities.

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

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APPENDIX C

Where We Are

At the present time, the Agency uses many variations in both the management and performance of ADP functions. The reasons for doing so include historical precedence, cost efficiency, geographic location, personality of the manager, similarity to other functions, and convenience. Decisions were made on a case-by-case basis as the need arose or when the ADP issue was addressed as a part of some other issue.

Table 2 is a summary of resources allocated to centralized and decentralized ADP activities. The Office of Data Processing (ODP) and the National Photographic Interpretation Center (NPIC) are identified as central facilities. Budgeted amounts for the SAFE Project, including equipment purchase/rental, contractual services and "other" have been added to centralized facilities.

The decentralized small computers are used for specific stand-alone applications. The centralized small computers are used for specific functions, or as a part of a larger network, i.e., communications switching, plotting, specialized printing, data entry. The purchase cost of centralized equipment is about \$31.7 million, of decentralized equipment about \$3.5 million. The total replacement value of installed Agency ADP equipment is about \$70 million. Table 3 lists Agency computers and their uses as identified in a recent survey.

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The operating budget allows for [] ADP positions, of which [] are for ODP and [] for NPIC. The work years figures shown were collected from a questionnaire distributed to Agency components. The responses indicated more effort being devoted to ADP than allowed for in the budget. These figures are included as an indication of the difficulty in measuring and accounting for decentralized activities. An additional 120 man years will be performed this year by contractors, primarily in software development and equipment maintenance.

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Table 4 shows the FY-77 and FY-78 budgets for ADP activities distributed according to the same centralized-decentralized guidelines assumed previously. Of the \$14,724,000 increase requested in FY-78, the SAFE Project accounts for \$5,900,000. It was recognized that the operating budget accounts for something less than the full range and scope of Agency ADP activities, and the current Program Call attempts to rectify this by requesting that manpower and funding needs for ADP activities be reported. It also requires explicit ADP requirements statements, and new systems or substantial enhancements to existing systems are to be fully explained and justified.

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Over the years, the Agency ADP budget has increased on an average of about \$4 million a year, and has increased by 9 times in 14 years. The current plan for capital outlays for the purchase of large computers in ODP and NPIC will be completed in FY 1982.

One of the most explosive areas of growth is in the area of on-line systems. Terminals are used for data base management, data entry, program development, documentation preparation, batch system job entry, query and reporting, plot displays, and many other activities by a large population of users. According to Table 1 of Appendix B, the 100th terminal was connected to ODP computers in 1971, the 500th in 1976. As of January 31, 1977, 710 were connected. Table 5 shows the numbers of terminals of different types connected to ODP and NPIC computers. From the increases in the numbers of terminals, one could argue with some justification that decentralization has already occurred on a large scale. The decentralized small computers also have terminals attached. We have no firm figures, but estimate that from 100 to 250 terminals of various types and costs are attached to these decentralized facilities.

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

Table 1: Chronology

1959 First computer installed in DDO (IBM 650)

1960 First computer installed in NPIC (ALWAC)

First computer installed in Comptroller's Office (RCA 501)

1963 Office of Computer Services (OCS) created in DDS&T
(Predecessor of ODP)

1964 First computer installed in OSO (DIV/D) (SDS 920)

First store-and-forward switch (MAX) installed in
OC [REDACTED]

Computer and ADP personnel in Comptroller's Office
transferred to OCS

1965 First IBM 360 computer installed in OCS

1966 First computer installed in OCR (IBM 360/30)

1967 Information Processing Staff created in O/Compt

1969 First major interactive system installed in OCS
(CP on 360/67)

1971 100th terminal installed on OCS computers

Major Data Base Management System installed in OCS (GIMS)

1972 IBM 360/195 computer installed in OCS

1973 OCS transferred to Directorate for Management and
Services (Now DDA) and renamed Office of Joint Computer
Support (OJCS)

OCR computer support transferred to OJCS

ADP and Engineering Procurement Branch established
in OL

1974 Information Processing Staff abolished

Univac 1110 multiprocessor system installed in NPIC

ISS/DDO computers transferred to OJCS

25X1A 1975 HR [REDACTED] promulgated (ADP Management and Administration)

1976 OJCS renamed Office of Data Processing (ODP)

1976

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Table 2: Resource Allocation

	<u>Centralized</u> <u>(ODP, NPIC and Others)</u>	<u>Decentralized</u> <u>(Standalone minis)</u>	<u>Total</u> <u>Agency</u>
Small Machines	21	72	93
Medium Machines		2	2
Large Machines	14		14
ADP Personnel			
Nov. 76 ADP Positions			
Nov. 76 ADP Work Years			
FY-77 Budget (Thousands)			
FY-78 Budget (Thousands)			

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TABLE 5
AGENCY COMPUTERS

<u>PURPOSE</u>	<u>SIZE</u>			<u>OFFICE(S)</u>
	L	M	S	
SIGNAL COLLECTION			22	OSO
SIGNAL PROCESSING AND ANALYSIS		3	9	OSO
IMAGE EXPLOITATION AND MENSURATION	4	1	9	NPIC, ORD
GENERAL COMPUTER SERVICES	8		3	ODP
EQUIPMENT TESTING			7	OTS, OS
CARTOGRAPHY			8	OGCR, NPIC
DATA MANAGEMENT			5	ORD, OSO
DATA COMMUNICATIONS			6	NPIC, ODP
WORD PROCESSING		1	1	OL, OCI
ACCESS CONTROL			2	OS
OTHER	<u>2</u>	<u>—</u>	<u>10</u>	ODP, ORD
TOTALS	14	5	82	

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

CONFIDENTIAL

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Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

Approved For Release 2002/01/08 : CIA-RDP83T00573R000100020004-8

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Table 5: Terminals Provided by the Central Services

Service By	Service To					Total
ODP	DD/A	DD/I	DD/S&T	DD/O	DCI	
Display	226	146	61	106	6	545
Typewriter	70	31	16	21	1	139
Remote Job Entry	16	4	3	2	1	26
NPIC						
Display		7	371			378
Typewriter		1	67			68
Remote Job Entry		1	14			15
Special			31			31
	312	190	563	129	8	1,202

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APPENDIX D

Pros and Cons of Centralization/Decentralization
(Excerpted from "The Waves of Change" by Charles P. Lecht)

Centralized

Large incremental expansion steps and costs.

Higher cost backup or redundancy.

Restricted and slower access to centralized files

Easier management and control of operations, standards, applications development and data bases.

Greater growth and expansion of CPU, storage and I/O devices.

Improved total compatibility.

Capability to process large, complex applications.

Reduces duplication of effort.

Higher total systems communications costs.

Lower availability/reliability.

Congestion factors - overhead responsiveness, contention over control.

Less flexibility or tailoring to end users' needs.

Greater dependence on DP.

Decentralized

Smaller incremental costs for expansion and off-loading from host.

Lower cost and more effective backup capability.

Easier and faster accessibility to local files.

More difficult management and control of operations, standards, applications development and data bases.

Restricted growth; i.e., CPU power, storage capability and I/O device selection.

Possible incompatibilities.

Application size and complexity restrictions.

Duplication of input, output and functions.

Lower total system communications costs.

Higher availability/reliability.

Greater responsiveness, lower overhead and contention.

Easier tailoring to actual end-user requirements.

Less divisional dependence on DP.

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Economics of scale:
hardware, software, data,
space and talent sharing.

Higher costs due to duplication
of hardware, software, data,
space and people.

Flexibility to adapt to future
requirements or change.